N80-75858

JSC-14029
Revision B

CHANGE NO. 1

SEP 22 1980

SHUTTLE/PAYLOAD STANDARD INTEGRATION
PLAN FOR DEPLOYABLE-TYPE PAYLOADS

SEPTEMBER 10, 1980

CHANGE INSTRUCTIONS

1. Remove the following listed pages from the PIP and replace them with the pages attached to this change sheet.

Page Descr.	CR/D NO.
1	- - -
2	P14029-7
9	- - -
10	P14029-7
11	P14029-7
12	P14029-7
23	- - -
24	P14029-7
25	- - -
26	P14029-7
27	- - -
28	P14029-7
29	- - -
30	P14029-7
33	P14029-5
34	P14029-5

NOTE: When four asterisks (****) appear ahead of a line of text (usually the first line of a paragraph), data in that paragraph have been changed to conform with direction of the CR/DIR.

2. Sign and date this page in the spaces provided below. Place this page behind the DESCRIPTION OF CHANGES page in the PIP as a record of the action.

Signature of person incorporating change _____ Date _____

DESCRIPTION OF CHANGES TO

SHUTTLE/PAYLOAD STANDARD INTEGRATION PLAN FOR DEPLOYABLE-TYPE PAYLOADS

CHANGE NO.	DESCRIPTION/AUTHORITY	DATE	PAGES AFFECTED
--	Baseline Issue	Feb. 79	
REV A	Complete revision, replaces and supercedes basic issue/ P-14029-1	Aug. 79	All
1	Added precedence statement to Section 14 and added explanation of schedule milestones/P14029-2	09/26/79	23,25
REV B	Complete revision, replaces and supercedes Revision A, Change 1/P14029-3;-4	06/10/80	All
1	Revised PIP Annex submittal dates; editorial chgs/ P14029-5;-7	09/08/80	2,10,11,12 24,26,28,30

Changes are indicated by "****" at the beginning of the paragraph.

1.0 INTRODUCTION

The National Aeronautics and Space Administration (NASA) and the {user organization} plan to launch and deploy in orbit a {payload name}, using the Space Transportation System (STS). (Another sentence would indicate if additional launches or retrieval of this payload are planned.)

For purposes of this Payload Integration Plan (PIP), the STS shall be represented by the NASA Lyndon B. Johnson Space Center (JSC) and the NASA John F. Kennedy Space Center (KSC). The {payload name} shall be represented by {responsible organization}.

This PIP is the document identified in Part II, Article I of the Launch Services Agreement (LSA) between the NASA and the {payload organization}. This plan provides the management roles and responsibilities, and a definition of the technical activities, interfaces, and schedule requirements to accomplish the integration, launch, and deployment of the {payload organization} payload with the STS. All services to be furnished by NASA to the User under this PIP shall be furnished by the NASA using its best efforts.

2.0 MANAGEMENT RESPONSIBILITIES

The responsibility for assuring the definition, control, implementation, and accomplishment of the activities identified in this document for the STS is vested with the Shuttle Payload Integration and Development Program Office (SPIDPO) at the NASA JSC and for {payload name} with the {responsible organization}.

2.1 Joint Responsibilities

The NASA and the {payload organization} will support the necessary integration activities, both analytical and physical, identified in this plan and according to the schedules contained in Section 15. The NASA and the {payload organization} will staff the interface working groups with the technical personnel responsible for the accomplishment of the integration tasks. The interface working groups include management, structural/mechanical, avionics, thermal, flight planning, flight operations, and ground operations.

2.1.1 Documentation.- The primary documentation to ensure proper integration of the payload will consist of the PIP, the PIP annexes, and appropriate Interface Control Documents (ICD's). The PIP, PIP annexes, unique ICD (or ICD addendum), and

associated changes will be jointly approved by the NASA and the (payload organization). However, any technical change that may result in an increase in total charges for services provided or total costs incurred by NASA under ISA and associated PIP must be referred to the Associate Administrator for Space Transportation Systems Operations or his designee for approval and for incorporation of the change as an amendment to the LSA. Configuration control will be initiated upon signature approval. The NASA JSC will maintain configuration control of the cited documentation in accordance with the Change Control Requirements and Procedures Manual, JSC 13995, with the exception of the Launch Site Support Plan Annex, which will be maintained by the KSC in accordance with (no.) plan.

In the event of inconsistency, unless otherwise expressly provided herein, such inconsistency shall be resolved by giving precedence in the following order:

a. The Launch Services Agreement and annexes to the Launch Services Agreement

**** b. NASA OSF Safety Policy and Requirements for Payloads Using the Space Transportation System, NHB 1700.7

c. The Payload Integration Plan other than its annexes, payload Interface Control Documents (as applicable), and applicable documents

d. Payload Interface Control Documents

e. Payload Integration Plan annexes

f. Payload Integration Plan applicable documents

2.1.2 Reviews.- The following reviews will be implemented to assess the cargo integration process as described in the Shuttle Payload Integration Activities Plan, JSC 14363:

a. Cargo Integration Review (CIR)

b. Integration Hardware/Software Review (IH/SR)

c. Flight Operations Review (FOR)

d. Ground Operation Review (GOR)

e. Flight Readiness Review (FRR)

f. Payload Safety Reviews (PSR)

landing will be completed by launch plus 6.5 hours for a 28.5 deg inclination or 5 hours for a 57 deg inclination. For abort descent and landing, the payload shall be designed so that the resulting thermal conditions present no hazard to the Orbiter or the crew. For flight contingency landing sites, no ground purge capability of the cargo bay will exist.

4.3.3.1 Thermal Environment: The (payload name) design and operation shall be compatible with the following attitude conditions. (For low beta angle, 28.5 deg inclination, use the following words and table.) The STS will normally be oriented with the cargo bay facing Earth (+ZLV) with multiple allowable excursions of solar viewing (+Z Solar) or deep space viewing (+Z Space) as shown in Table 4-1. The table also specifies the payload recovery times for these excursions, so that repeat of the required attitudes can be planned. Recovery from worst-case attitude exposure is required before initiation of payload deployment if this attitude exceeds TBD minutes.

Table 4-1.- BETA ANGLE LESS THAN 60 DEG
ATTITUDE REQUIREMENT

Attitude	Required time	Payload recovery time at +ZLV
+ZLV	Continuous	N/A
+Z Solar	30 min	TBD
+Z Space	90 min	TBD
Payload worst solar angle	TBD	TBD

(For high beta angle cases, use the following words and table.) The STS will normally be oriented in a Passive Thermal Control (PTC) attitude, which is defined as X-axis perpendicular to the solar vector and rolling about X-axis at a rate of 2 to 5 rev/hr with multiple allowable excursions of solar viewing (+Z Solar), deep space viewing (+Z Space), or Earth viewing (+ZLV) as shown in Table 4-1. The table also specifies the payload recovery times for these excursions, so that repeat of the required attitudes can be planned.

Table 4-1.- BETA ANGLE GREATER THAN 60 DEG
ATTITUDE REQUIREMENT

Attitude	Required time	Payload recovery time at PTC
+PTC	Continuous	N/A
+ZIV	6 hr (followed by 3 hr PTC)	TBD
+Z Solar	30 min	TBD
+Z Space	90 min	TBD
Payload worst solar angle	TBD	TBD

**** Airborne support equipment remaining in the cargo bay after deployment of the payload shall be compatible with the Orbiter attitude capability as defined in Paragraph 6.1.1.2 of ICD 2-19001. However, this requirement shall not require an active cooling system. In the event of failure to deploy the (payload name) because of STS problem(s), the thermal attitude constraints of Table 4-1 shall apply. In the event of a payload failure, the STS attitudes will be constrained only by (payload name) safety constraints. These requirements will be defined by the (payload organization) in terms of maximum solar and deep-space exposure times in the flight operations decisions section of the Flight Operations Support Annex.

4.3.3.2 Ground Communications: For on-orbit attached PF checkout, (no.) minutes of real-time telemetry coverage are required. The command and data interface is discussed in Sections 5.3 and 5.4 (if required). The antenna pointing and attitude requirements are TBD.

**** 4.3.3.3 Deployment Opportunity: For initial planning, the primary deployment opportunity shall be based on the perigee motor burn occurring at TBD deg longitude plus or minus 25 deg. At least one backup deployment opportunity shall be provided which meets as many (payload name) constraints as practical without violating overall STS constraints or those of other shared payloads. User-imposed constraints, more restrictive than the above, may result in optional service charges. The payload shall be compatible with both ascending and descending node deployments.

4.3.3.4 STS/(payload name) Deployment Timing and Pointing: The Orbiter will be oriented within plus or minus 2 deg of the

payload-specified inertial deployment attitude as referenced to the plane of the payload longeron/cradle interface. The STS will deploy the (payload name) within plus or minus 2 seconds of the specified deployment time.

The STS shall be responsible for computing the time of (payload name) deployment by computing the time of the designated equatorial crossing based on the computed Shuttle flight trajectory. The Shuttle flight trajectory shall be updated as close to the designated equatorial crossing as possible within the constraints of tracking data, Orbiter data, and computational time.

If the predicted deployment parameters fall outside the limits specified in Section 4 above, the payload will not be deployed at this opportunity and will be scheduled for deployment at the next planned deployment opportunity.

The accuracy of the knowledge of the orbit parameters is timeline-dependent. Table 4-2 defines expected navigational accuracies (3 sigma) and is based on an STS timeline and orbital parameters consisting of PTC attitude, an IMU alignment, maneuvering to the payload deployment attitude, 160 n.mi. altitude, 28 to 57 degree inclination, and a 2.25-hour (outside the tracking data arc) propagation interval. STS maneuvers required for payload activities (i.e., star scans, thermal attitude, special pointing, etc.) are not included.

**** Table 4-2.- ORBITER STATE VECTOR UNCERTAINTY AT PAYLOAD DEPLOYMENT

Position, ft (m)			Velocity, ft/sec (m/sec)		
Radial	In-track	Cross-track	Radial	In-track	Cross-track
4,291 (1,500)	34,450 (10,500)	4,291 (1,500)	38.4 (11.7)	5.9 (1.8)	9.8 (3.0)

Detailed navigational analysis, if required by the payload, shall be an optional charge.

4.3.3.5 STS/(payload name) Separation: The (payload name)-provided linear separation rate from the STS shall be no less than 1 ft/sec (0.3 m/sec) and the perigee motor ignition shall not occur earlier than 45 minutes after deployment. The expected (payload name) separation rate is TBD ft/sec. The payload attitude control system shall not be activated prior to a separation distance of 200 feet (61.6 meters).

**** The standard Orbiter separation maneuver will be designed to minimize reaction control system plume impingement on the payload, consistent with achieving a safe separation distance.

**** 4.3.3.6 Photographic Coverage: Photographic or television coverage of the (payload name) deployment and separation from the STS will be initiated by the flight crew.

**** 4.3.3.7 Ku-Band System: The payload shall be compatible with the Ku-band system environment defined in ICD 2-19001.

**** 4.3.3.8 Other Constraints: (Include other required payload constraints.)

5.0 (payload name)-TO-STS INTERFACES

The STS mechanical, electrical, avionics, and environmental interfaces are defined in ICD 2-19001 with which the (payload name) spacecraft must be compatible. The STS-to-payload-carrier interfaces are specified in ICD A-(appropriate carrier ICD; i.e., SSUS, IUS, etc.). Any unique interfaces agreed to in addition to those specified in ICD 2-19001 will be defined in a unique STS/(payload name) ICD. The cargo bay electrical and fluid interfaces, except for the RF interface, are physically located above the Orbiter Z-axis 410 station, at or near the trunnion interface, on (TBD). (Define location of umbilical panel.)

5.1 Structural/Mechanical Interfaces

The structural/mechanical interface between the (payload name) and the STS consists of (no.) longeron trunnions and (no.) keel trunnions that will attach to the STS-provided longeron and keel attach fittings. The mechanical interface between the Shuttle Orbiter and the (payload name) will be specified in STS/(payload name) ICD TBD.

5.2 Cable Interfaces

The (payload name) will use (no.) section(s) of the standard aft flight deck and cargo harnesses in accordance with the mixed user allocations section of JSC 07700, Volume XIV.

Specific wiring pin function assignments will be defined in the STS/(cargo or carrier ICD, as appropriate).

		(10.1.2) Provide premission interface testing utilizing POCC-provided data tapes
i.	TTY	Provide full duplex TTY capability to remote POCC
j.	Facsimile	Provide full duplex facsimile capability to remote POCC
k.	Optional services	Services required which are not identified as standard services in POCC Capabilities Document

(Indicate requirement by placing "X" in appropriate column.)

9.0 LAUNCH AND LANDING SITE SUPPORT

The Launch Site Support Manager receives/coordinates the (payload organization) launch and landing requirements, and documents a formal KSC (payload organization) Launch Site Support Plan (PIP Annex 8).

The (payload organization) will retain prime responsibility for test, checkout, servicing operations, etc., of the payload while in the Payload Hazardous Processing Facility (ESA-6C, Hangars SAEF-2, DSIF, etc.).

9.1 Payload Processing Facility

The Payload Processing Facility (PPF) (PPD Building) has been tentatively scheduled for the (payload name) for receiving inspection, assembly, test, and checkout. An electrical ground support equipment station may be established to monitor and conduct checkout via hardlines and RF as the spacecraft is processed through the KSC facilities. The following is a list of some project-unique operations that may be performed in the Payload Processing Facility.

a. Receiving/inspection

b. Removal/installation of cover

c. Initial pressure system test

d. Propellant system "leak" test

e. Functional/performance verification test

f. Weight and center of gravity determination

g. Communications (KSC, JSC, POCC, etc.)

h. Battery checks

**** Once the Payload Processing Facility operations have been completed, the (payload name) will be transported by (TBD) to a Hazardous Processing Facility (HPF) if hazardous operations are required. If hazardous operations are not required, the (payload name) will go directly to the Vertical Processing Facility (VPF) for cargo integration operations. All support provided by the NASA in a PPF is an optional service. Optional charges for use of a PPF and the KSC's support to a payload in a PPF would be included in an optional services package, should the payload organization choose to purchase one. The optional services package is described in the STS Reimbursement Guide, JSC 11802.

9.2 Hazardous Processing Facility

The Delta Spin Test Facility (DSTF), ESA-60A, and SAEF 2 are the facilities where hazardous operations are conducted. Due to high use of the DSTF, some SSUS-D payloads may have to be processed in ESA-60A or SAEF 2 for fueling and ordnance installation, and then moved to the DSTF for mating and checkout with the upper stage. The (payload name) has been tentatively scheduled for processing through the TBD HPF. The following is a list of some operations that may be performed in this facility.

a. Fuel loading, pressurization, and leak checking

b. Ordnance installation

c. Spacecraft-to-SSUS-D mating

d. Spin balancing (DSTF only)

e. Cryogenic servicing

f. Apogee kick motor installation (if applicable)

Once the preceding operations have been completed, the mated (payload name) and carrier will be moved to the Vertical Processing Facility via a transporter provided by (TBD). Optional charges for use of a HPF and the KSC support to a

payload in the HPF would be included in an opticnal services package.

9.3 Vertical Processing Facility

Once the transporter carrying the (payload name)/carrier enters the Vertical Processing Facility airlock, it undergoes cleaning before entering the cargo integration test equipment/workstand area. The payload/carrier is then hoisted into the appropriate position in the workstand according to the vertical cargo manifest. The SSUS-A and IUS are mated with their spacecraft, and scheduled interface verification testing is conducted. The (payload organization) will support the verification process as defined in the Launch Site Support Plan Annex. The following is a list of some operations that may be performed in this facility.

a. Spacecraft-to-upper stage mating and interface verification

b. Spacecraft/upper stage functional testing

c. Cargo integration test equipment

d. End-to-end test

e. Category B ordnance installation and test

When all the interface verification tests have been completed, the total manifested integrated cargo is placed in the KSC payload (vertical) canister for transportation to the rotating support structure at the pad. Cargo Integration Test Equipment operations are included as a standard service. Operations which involve only a spacecraft and/or its upper stage will normally be subject to an optional service charge. Payload-dedicated time in the VPF is not included in the optional services package and must be negotiated as an additional optional service, if required.

9.4 Pad Operations

Once at the pad, the payload (vertical) canister will be hoisted into position and the full manifested cargo extracted from the canister by the Payload Ground Handling Mechanism and retracted into the rotating support structure. The rotating support structure may be available in the rollback position for systems test before or during Orbiter-to-pad transfer operations, but there will be a charge as an optional service unless done in parallel with NASA operations on a noninterference basis. After the mobile launcher platform is hard-down on the pad, the rotating support structure will be rotated into position and the

**** total cargo will be inserted into the Orbiter cargo bay, using the handling mechanism. Before the cargo bay doors are closed, the total cargo-to-Orbiter interface verification tests, closeout procedures, and payload-unique tests (end-to-end test) will be accomplished. Orbiter cargo bay door closing will be the last time that the (payload name) may be accessed before lift-off. Prelaunch control and monitoring of cargo functions may be provided via hardwires through the T-0 umbilical to a payload ground support equipment control room located in the Launch Control Center or to the Payload Processing Facility as required.

9.5 Postflight Processing

After landing at the Shuttle Landing Facility, the Orbiter is towed to the Orbiter Processing Facility for deservicing/safing operations. Once the deservicing/safing operations have been completed, the payload (using the strongback) will be removed from the Orbiter cargo bay and placed in the KSC (horizontal) canister. The payload is then transported to the appropriate area for return to the (payload organization).

9.6 Aborted Flight

If an aborted flight lands at the KSC Shuttle Landing Facility, the payload will be removed and returned to the (payload organization). If a flight ends at the secondary landing site or at a contingency landing site, the User should be prepared to aid in the process of transporting the payload to its next destination. From the secondary landing site, it is planned that cargo aboard the Orbiter will remain onboard for ferry to the launch site via the Shuttle carrier aircraft.

For the very remote possibility of landing at a contingency landing site outside the continental United States, methods of transport for the Orbiter and its cargo may vary. The NASA will arrange for temporary facilities at these sites and will make its best effort, within existing policies, to integrate transportation of payload personnel and equipment to and from the landing site with the planned Orbiter operations. Any optional service charges necessary will be established once detail payload requirements are defined.

9.7 STS-Provided Transportation of Oversize Payloads

(If the user requires the use of the NASA Guppy aircraft, insert the following.)

The STS will provide transport of the {payload name} as an optional service, according to the provisions defined in the Super Guppy Charter Agreement and the schedule indicated in Section 15.0.

10.0 SAFETY

The {payload organization} is responsible for assuring that the {payload name}, the associated airborne support equipment, and the associated ground support equipment are safe. The {payload name} and ground support equipment shall be designed to comply with the requirements of NASA Office of Space Flight document "Safety Policy and Requirements for Payloads Using the Space Transportation System." To assess compliance with the safety requirements, four phases of safety reviews for the payload, ground support equipment, and ground operations safety will be conducted by the NASA in accordance with "Implementation Procedure for STS Payload Safety Requirements," JSC 13830. The ground support equipment and ground operations safety reviews will be coordinated/scheduled by the KSC/Launch Site Support Manager and may be held in conjunction with the flight safety reviews or ground operations meetings.

The safety documentation required to support each safety review will be provided to the appropiate NASA organization (KSC ground operations and JSC flight operations) by the {payload organization} 30 days before the scheduled safety review. The results of the safety reviews and assessments will be the safety certification of the {payload name} and ground support equipment by the {payload organization} before delivery and start of processing and installation in the Orbiter cargo bay. The {payload organization} will submit a flight readiness statement for the {payload name} at the flight readiness review.

11.0 INTERFACE VERIFICATION

The {payload organization} is responsible for verifying compatibility with the interfaces and environments specified in the PIP and applicable ICD's. The nonsafety-associated interface verification requirements and planning will be negotiated and concurred in by the NASA and the {payload organization}. It is anticipated that this interface verification will be accomplished within the scope of normal test, checkout, and integration flow of the {payload name} spacecraft. After mechanical and electrical checkout of the payload by the {payload organization}, an interface validation and compatibility test will be conducted by the STS in the Cargo Integration Test Equipment (CITE) to verify electrical compatibility with the Orbiter. The interface

**** verification requirements are specified in "Payload Interface Verification Requirements," JSC 14046, and are submitted by the (payload organization) in the Payload Interface Verification Summary Annex.

12.0 POSTFLIGHT DATA REQUIREMENTS

(Specify if required.)

13.0 SUMMARY OF OPTIONAL SERVICES

A summary of the optional services expressly identified herein to be provided and priced to (payload organization) for (payload name) integration are as follows:

(Example)

1. Reference Paragraph 6.1 - The NASA will conduct the (no.) structural coupled dynamic loads analysis cycle for the (payload organization) as an optional service. The loads analysis will be accomplished using the (payload organization)-provided spacecraft mathematical models. The results will be provided to the (payload organization) (if specified in Paragraph 6.1).

2. Etc.

Planning and budget estimates of reimbursements for the payload transportation requirements and the above optional services are displayed in the STS Preliminary Price Summary, Figure 13-1. These estimates are intended to provide preliminary information on the assumed level of cost to be borne by the User and will change through more detailed definition and joint negotiations. The estimates are stated in current year dollars and the use of these estimates for planning purposes should be adjusted for inflation. Prior to the initiation of the individual optional service(s), the performing NASA organization and the User will jointly scope the tasks and the performing NASA organization will establish the estimate of Governmental costs, the fixed-rate cost, or the fixed-price cost as appropriate, and provide it to the User. The NASA will request, through an ISA amendment, the User's approval of the task/cost and, if no User Miscellaneous Services Account exists or if sufficient funds are not available in an existing User Miscellaneous Services Account, provision of required funding. The NASA will not initiate the optional service(s) until User approval of the LSA amendment and funding is received.

14.0 PIP ANNEXES

As identified in other sections of the document, the following annexes are required from the User. (List must include those annexes defined in the body of the PIP.)

In case of any conflict between this plan and the following PIP annexes, the PIP shall take precedence. Any requirements submitted in the annexes that are not within the scope of the PIP will not be considered binding on the NASA for implementation.

Annex 1 - Payload Data Package

Annex 2 - Flight Planning

Annex 3 - Flight Operations Support

Annex 4 - Orbiter Command and Data

Annex 5 - Payload Operations Control Center, Volume II

Annex 6 - Orbiter Crew Compartment

Annex 7 - Training (if required)

Annex 8 - Launch Site Support Plan

Annex 9 - Payload Interface Verification Summary

15.0 SCHEDULE

The attached schedule, Figure 15-1, provides a summary of the various technical areas requiring data exchange and/or products in support of the STS/(payload name) integration activities.

The data indicated in Figure 15-1 under "Reference Milestones" are included for information only and are controlled by the STS or User organization.

Dates indicated in Figure 15-1 under "Standard Service Milestones" are directly related to the launch date specified in the current STS manifest; the dates will be adjusted and tasks will be accomplished according to the current NASA-approved flight date. Necessary changes to the activities caused by a change to the flight date will be coordinated with the User through the PIP change process.

16.0 APPLICABLE DOCUMENTS

The following documents are applicable to the extent stated herein.

**** a. NASA OSF Safety Policy and Requirements for Payloads Using the Space Transportation System, NHB 1700.7, current issue.*

b. Implementation Procedure for STS Payload Safety Requirements, JSC 13830, dated May 1979.

c. STS/(payload name) Interface Control Document TBD.

**** d. STS Reimbursement Guide, JSC 11802.

e. Space Transportation System Models Configuration Management/Control System and Standard Analyses for Payload Load Cycle, SD77-SH-0214A, dated December 1978.

f. KSC Launch Site Accommodation Handbook, K-STSM-14.1, current issue.*

g. SPIFPO Change Control Requirements and Procedures Manual, JSC 13995B, dated August 17, 1979.

h. Shuttle/Payload Integration Activities Plan, JSC 14363.

**** i. Space Shuttle System Payload Accommodations, JSC 07700, Volume XIV, including Attachment 1 (ICD 2-19001), current issue.*

j. Criteria/Guidelines for Payload Thermal Math Models for Integration Analysis, JSC 14686, dated January 1979.

k. Payload Interface Verification Requirements, JSC 14046 (not released).

**** *Current issue includes all future changes and revisions.

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PIP NO. _____

SPIDPO SIGNED _____

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○ JOINT

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TYPICAL PAYLOAD INTEGRATION SCHEDULE

PAGE 1 OF 2

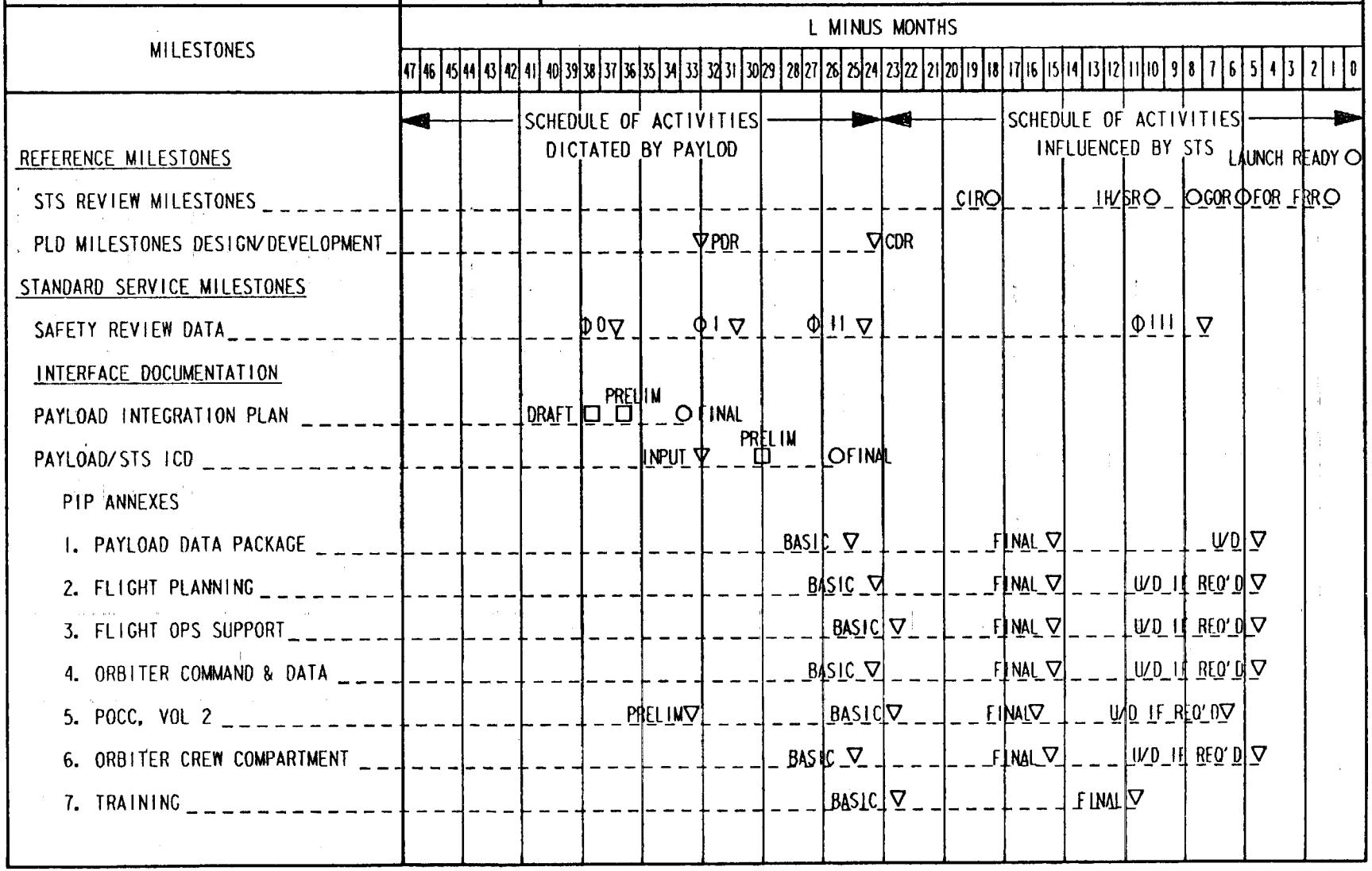

Figure 15-1

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PIP NO. _____

SPIDPO SIGNED _____

□ STS

▽ P/L

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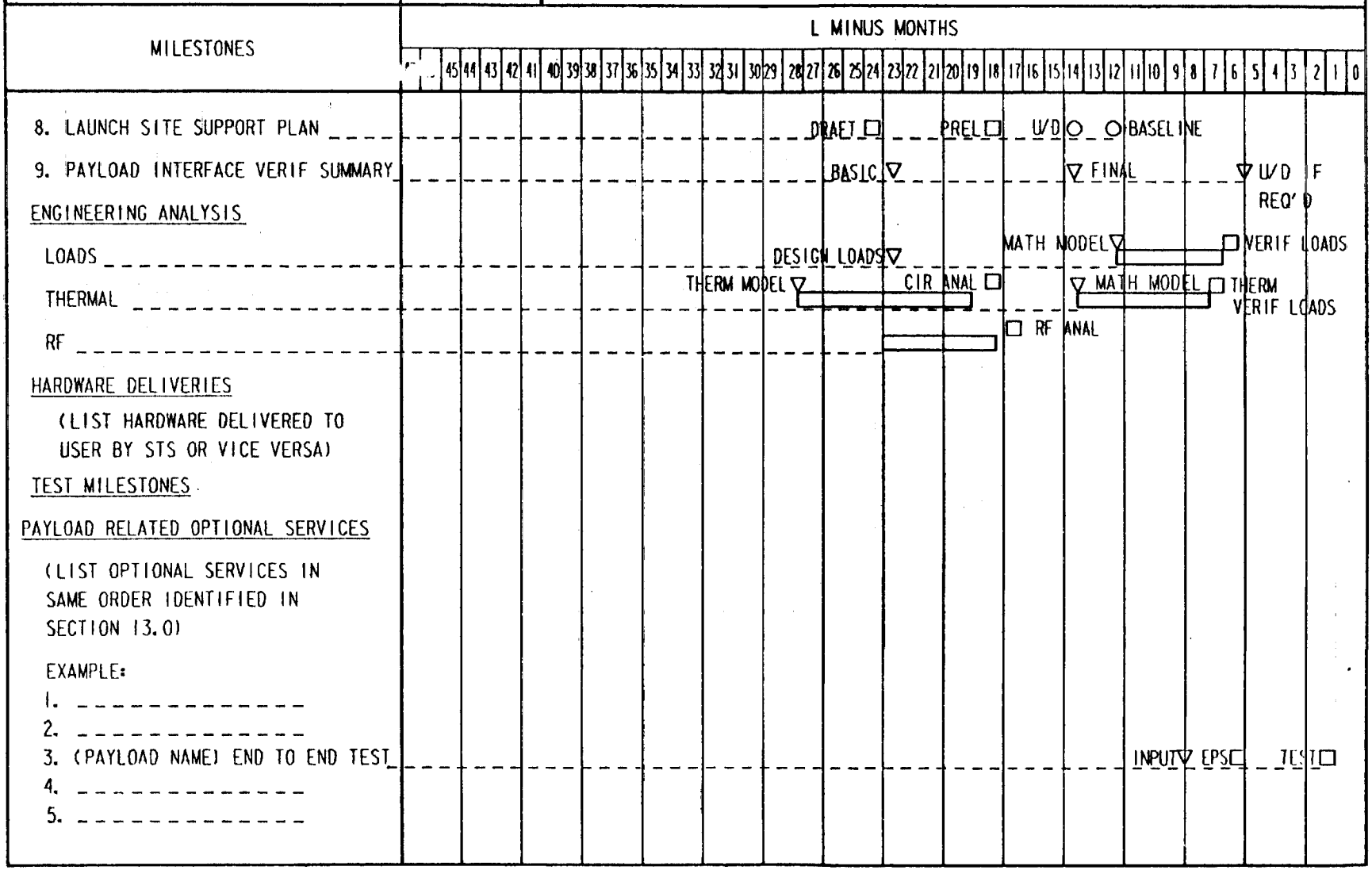
TYPICAL PAYLOAD INTEGRATION SCHEDULE



NASA-JSC

Figure 15-1

DISTRIBUTION LIST FOR DEPLOYABLE STANDARD PIP JSC-14029

NASA/JSC
BT/W. L. Draper
BT3/F. Peters
CA6/C. L. Stough
CB/Payloads
CF/S. Liebergot
CF3/M. G. Kennedy
CG/J. Bilodeau
CG3/D. Dahms
CG5/T. A. Guillory
CG5/J. A. Wegener
CG5/B. Holmberg
CG5/D. Mosel
CG5/D. Lewis
CG5/M. Hazelrigs
CG5/J. Whiteley
CG5/J. Shinkle
CG5/W. Huning
CH/J. W. O'Neill
CH6/J. Shannon
CH6/B. L. Kyle
CH6/J. Plesums
CH6/J. J. Conwell
CH6/L. Bourgeois
CH6/A. M. Larsen
EA3/R. S. Sayers
EA8/L. Bell
EA8/F. DeVos
EC2/W. Morris
ED/D. Gerke
ED4/J. D. Harris
ED4/J. Langford
ED4/L. Redmond
EF2/C. Watkins
EH2/T. W. Eggleston
FS/D. H. Greenshields
FS/D. C. Wade
ES/B. Wren
ES3/R. G. Brown
ES5/M. Steinthal
EW5/C. Perner
FW5/W. Langdoe
FA2/S. Sanborn
FD/C. Huss
FE/S. Faber
FM17/L. Hartley
FM2/H. B. Beck
FM2/J. Bell
FM4/C. Gott
FS15/E. Clayton (3)
FS15/T. Stuart
FS15/L. Croom
FS5/J. Parker
JM57/R. Cline (4)
LA2/R. Kohrs
LA3/R. Machell
LM/A. Bishop (2)
ME/P. Dean
MG/A. Aldrich
MP/C. McCullough
NA/M. Raines
NS2/B. Miller (5)
NS2/E. Schlei
PA/G. Lunney (5)
PA/J. Bostick
PA/D. Schultz
PF/L. Nicholson
PF/H. Battaglia
PF/L. Ballinger
PF/W. Eaton
PF/I. Eichelman
PF/V. Ettredge
PF/C. Filley
PF/C. Hatlelid
PF/B. Hungerford
PF/P. Jaschke
PF/G. Kenney
PF/H. Lambert
PF/J. Liller
PF/J. Llewellyn
PF/J. Lowe
PF/J. O'Loughlin
PF/H. Scott (10)
PF/R. Zedekar
PH/L. Williams
PH/W. Huffstetler
PH/R. Davidson
PH/A. Joslyn
PH/P. Westmoreland
PH/W. Speier
PH/S. Blackmer
PH/G. Meester
PH/D. Hudson
PL/B. Everline
SA5/R. Moke
WA/R. Colonna
WA/W. Wolhart
WA3/B. Blount
WC/M. A. Collins (2)
WC2/J. Mechelay
WC2/M. Crocker (5)
WC2/K. Hoffman
WC2/R. Morton
WC2/W. Waln
WC6/A. Collom
WC6/W. Gaylor
WC6/J. De Moss
WC6/J. Mistrot
WC6/D. Murrah
WC6/C. Walsh
WT3/Z. Eubanks
ZR1/Col. J. T. Watson

NASA/AMES
244-14/C. Wiltsee (5)
204-121/MATSCO Doc. Ctr.

NASA/GSFC
400.0/W. Keathley (2)
400.4/J. Purcell
405.0/R. Browning
406.0/C. Wagner, Jr.
408.0/F. Cepollina
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JSC-14029
Revision A

CHANGE SHEET

FOR

SHUTTLE/PAYLOAD STANDARD INTEGRATION
PLAN FOR DEPLOYABLE-TYPE PAYLOADS
CHANGE 1

CHANGE INSTRUCTIONS

1. Remove the following listed pages and replace with the same numbered attached page:

Page	CR/DIR NO.	PAGE	CR/DIR NO.
ii	- -	20	- -
iii	- -	21	- -
vii	- -	22	- -
viii	- -	23	P14029-2
ix	P14029-2	24	- -
17	- -	25	P14029-2
18	- -	26	- -
19	- -		

Note: A black bar in the right hand margin indicates the information that was added or changed.

2. Sign and date as indicated below and place this page behind the enclosed "Document Revision Log."

Signature of person incorporating changes in the document

Date

09/26/79

REVISIONS

REV LTR	CHANGE NO.	DESCRIPTION	DATE
A	P-14029-1	Complete revision, replaces and supercedes basic issue dated February, 1979	Aug 79
--	1	Change per CD/DIR P14029-2	09/26/79

STANDARD FOR DEPLOYABLE PAYLOAD (TOTAL CARGO ELEMENT)

LIST OF EFFECTIVE PAGES

REVISION A 08/28/79
CHANGE 1 09/26/79

THE CURRENT STATUS OF THE DOCUMENT CHANGE PAGES IS AS SHOWN BELOW:

PAGE	DATE	PAGE	DATE
i	08/28/79	10	08/28/79
*ii	09/26/79	11	08/28/79
*iii	09/26/79	12	08/28/79
iv	08/28/79	13	08/28/79
v	08/28/79	14	08/28/79
vi	08/28/79	15	08/28/79
*vii	08/28/79	16	08/28/79
*viii	09/26/79	17	08/28/79
*ix	09/26/79	*18	09/26/79
1	08/28/79	*19	09/26/79
2	08/28/79	*20	09/26/79
3	08/28/79	*21	09/26/79
4	08/28/79	*22	08/28/79
5	08/28/79	*23	09/26/79
6	08/28/79	*24	09/26/79
7	08/28/79	*25	09/26/79
8	08/28/79	*26	08/28/79
9	08/28/79	A-1	08/28/79

*CURRENT CHANGE

CONTENTS

familiarization briefing for the crew and NASA flight controllers and for providing payload configuration data to support that training.

8.4 Flight Operations Control

The NASA will be responsible for integration of flight operations until the (payload name) is a safe distance from the Orbiter. The STS flight control operations will be conducted from the NASA-JSC Mission Control Center (MCC) using the Spaceflight Tracking and Data Network (STDN) network. (Payload organization) will provide a representative(s) at the JSC MCC during the (payload name)/STS flight to provide payload decisions to the STS flight control operations, assess flight progress, and coordinate operations interfaces between NASA, JSC, and (payload organization). (Payload Organization) flight control operations and control will be conducted from (Location and Control Center). (Payload organization) is responsible for all (payload name) operations after the Orbiter is out of the (payload name) hazard envelope. The STS shall provide the (payload control center) with the real time predicted and actual time of deployment from the STS. The basic plan, timelines and agreements for these operations, including necessary procedures, will be identified in the Flight Operations Support Annex.

8.5 Command and Control Support

The interface required between the mission control centers will be (a description of any interface with remote locations for command/data or voice lines). The engineering agreements necessary to implement these interfaces will be defined in the POCC Annex, Volume 2, as summarized in table 8-1. The use of these interfaces is defined in the Flight Operations Support Annex.

TABLE 8-1

MCC/Remote POCC Communication Interfaces

Type service	General service	Req'd	Not Req'd
A. Command	Relay (Remote Center name) generated command data to the payload via the Orbiter		
B. Telemetry	Strip selected telemetry data from the Orbiter down link, format and transmit to remote POCC		
C. Trajectory	Provide Orbiter trajectory-related vectors and attitude data to remote POCC		

D.	Voice	Provides voice intefaces between remote POCC and JSC MCC
E.	Video	Provide air-to-ground video to remote POCC
F.	Text and Graphics	Provide text and graphic data to JSC for uplink to Orbiter
G.	Tape to tape	Provide recorded data relay
H.	Test and simulation	Provide premission interface simulations and testing
I.	TTY/FAX	Provide secure hard copy interface
J.	Special services	(indicate any special service

(Indicate requirement by placing "X" in appropriate column.)

9.0 LAUNCH AND LANDING SITE SUPPORT

The Launch Site Support Manager (LSSM) receives/coordinates the (payload organization) launch and landing requirements and documents a formal KSC (payload organization) Launch Site Support Plan (PIP Annex-8).

The (payload organization) program will retain prime responsibility for test, checkout, servicing operations, etc. of the payload while in the Payload Processing Facility (ESA-60, Hangars SAEF-2, etc.) All integrated activities will be the responsibility of the appropriate NASA organization.

9.1 Payload Processing Facility (PPF)

Payload Processing Facility (TBD-Bldg) has been tentatively scheduled for the (TBD-S/C) for receiving inspection, assembly, test and checkout. An Electrical Ground Support Equipment (EGSE) Station, to monitor and conduct checkout via hardlines and RF as the spacecraft is processed through KSC facilities, may be established. The following is a checklist of project-unique operations which may be performed in the PPF.

a) Receiving/inspection
b) Removal/installation of cover
c) Initial pressure system test
d) Propellant system "leak" test
e) Functional/performance verification test
f) Weight and center of gravity determination
g) Communications (KSC, JSC, POCC, etc.)
h) Battery checks

Once the PPF operations have been completed, the (payload) is transported by means of (TBD) to the Hazardous Processing Facility (Delta Spin Test Facility) for mating/integration operations with the carrier, if required.

9.2 Hazardous Processing Facility (HPF)

The Hazardous Processing Facility (Delta Spin Test Facility) has been tentatively scheduled for the (payload)-to-carrier mating operations. Prior to spacecraft arrival at the facility, the propellant loading cart will be leak checked and serviced with propellant. The following is a checklist of the operations that may be performed in this facility:

a) Fuel loading, pressurized and leak checked
b) Ordnance installation
c) Spacecraft to SSUS-D mating
d) Spacecraft to SSUS-D interface verification
e) Transportation preparation

Once the above operations have been completed, the mated (payload) and carrier will be moved to the VPF via a transporter provided by (TBD).

9.3 Vertical Processing Facility (VPF)

Once the transporter carrying the (payload)/carrier enters the Vertical Processing Facility Airlock, it undergoes cleaning prior to entering the CITE/workstand area. The payload/carrier is then hoisted into the appropriate position in the workstand according to the vertical cargo manifest, and systems testing and interface verification testing conducted, as required. The following is a checklist of the operations that may be performed in this facility:

1. Spacecraft functional test
2. Spacecraft-to-SSUS-D interface verification
3. CITE testing
4. End-to-End test

When all the interface verification tests have been completed, the total manifested integrated cargo is placed in the KSC payload (vertical) canister for transportation to the Pad (RSS).

9.4 Pad Operations

Once at the pad, the payload (vertical) canister will be hoisted into position and the full manifested cargo extracted from the canister by the Payload Ground Handling Mechanism (PGHM) and retracted into the RSS. Some RSS time may be available in the rollback position for systems test prior to or during Orbiter-to-Pad transfer operations, but there will be a charge as an optional service unless done in parallel with NASA operations on a non-interference basis. After the Mobile Launcher Platform is hard-down on the pad, the RSS will rotate into position and the total cargo via the PGHM will be inserted into the Orbiter cargo bay. Prior to the payload

bay doors closing, the total cargo-to-Orbiter interface verification tests, closeout procedures and payload-unique tests (end-to-end test) will be accomplished. Orbiter payload bay door closing will be the last time that (payload) may be accessed prior to lift-off. Prelaunch control and monitoring of cargo functions may be provided via hardwires through the T-0 umbilical to a payload GSE control room located in the Launch Control Center (LCC) or to the PPF as required.

9.5 Postflight Processing

After landing at the Orbiter Landing Facility (OLF), the Orbiter is towed to the Orbiter Processing Facility (OPF) for deservicing/safing operations. Once the deservicing/safing operations have been completed, the payload (utilizing the strongback) will be removed from the Orbiter cargo bay and placed in the KSC (horizontal) canister. The payload is then transported to the appropriate areas for return to the (payload organization).

9.6 Aborted Flight

If an aborted flight lands at the KSC Orbiter Landing Facility (OLF), the payload will be removed and the (payload name) returned to (payload organization).

In the event that an aborted flight lands at the secondary or contingency landing site, the (payload organization) should be prepared to accept the payload at the landing site after removal from the cargo bay because of the limited ferry capability of the Shuttle Carrier Aircraft. If the cargo is within the ferry capability and associated safety requirements and is compatible with associated environments, the payload will be returned to KSC in the Orbiter cargo bay.

9.7 STS-Provided Transportation of Oversize Payloads

(If the User requires the use of the NASA Guppy Aircraft, insert the following.)

The STS will provide transport of the (payload name), as an optional service, according to the provisions defined in the Super Guppy Charter Agreement and the schedule indicated in section 15.0

10.0 SAFETY

The (payload organization) is responsible for assuring that the (payload), its ASE, and its GSE (ground support equipment) are safe. The (payload) and GSE shall be designed to comply with the requirements of NASA Office of Space Flight document "Safety Policy and Requirements for Payloads Using the Space Transportation System." To assess compliance with the safety requirements, four phases of safety reviews for the payload, ground support equipment, and ground operations safety will be conducted by the

NASA in accordance with JSC 13830, "Implementation Procedure for STS Payload Safety Requirements." The GSE and ground operations safety reviews will be coordinated/scheduled by the KSC LSSM and may be held in conjunction with the flight safety reviews or ground operations meetings.

The safety documentation required to support each safety review will be provided to the appropiate NASA organization (ground OPR KSC/LSSM , FLT OPS-JSC) by the (payload organization) 30 days prior to the scheduled safety review. The results of the safety reviews and assessments will be the safety certification of the (payload) and GSE by (payload organization) prior to delivery and start of processing and installation in the Orbiter cargo bay. The (payload organization) will submit a flight readiness statement for the (payload) at the flight readiness review.

11.0 INTERFACE VERIFICATION

The payload is responsible for verifying compatibility with the interfaces and environments specified in PIP and applicable ICD's. The non-safety associated interface verification requirements and planning will be negotiated and concurred in by the NASA and (payload organization). It is anticipated that this interface verification will be accomplished within the scope of normal test, checkout and integration flow of the (payload) spacecraft. Included within the flow at VPF is a Cargo Integration Test to verify pre-installation electrical and mechanical compatibility with the STS. The interface verification requirements are specified in JSC-14046, "Payload Interface Verification Requirements," and are submitted by the (payload organization) in the Interface Verification Annex.

12.0 POSTFLIGHT DATA REQUIREMENTS

(Specify if required).

13.0 OPTIONAL SERVICES

Planning and budget estimates of reimbursements for the payload transportation requirements and the previously cited optional services are displayed in the STS Summary Price Sheet, Figure 13-1. These estimates are intended to provide preliminary information on the assumed level of cost to be borne by the (payload organization) and will change through more detailed definition and joint negotiations. The estimates are stated in current year dollars and the use of these estimates for planning purposes should be adjusted for inflation.

The final estimates for Standard Shuttle Services and Optional Flight System Services will be jointly negotiated between NASA Headquarters and the (payload organization) in the Launch Services Agreement. Immediately prior to the initiation of the individual optional service, the performing NASA organization and the (payload organization) will jointly define the tasks and NASA will establish the price on an estimated price sheet according to the Section 15 schedule for the optional service(s).

STS SUMMARY PRICE SHEET

PLANNING AND BUDGET ESTIMATES* AS OF

PAYLOAD IDENTIFICATION:

TOTAL ESTIMATED PRICE

$ _____

STANDARD SHUTTLE PRICE	OPTIONAL FLIGHT SYSTEM PRICE	OPTIONAL SERVICE PRICE
$ _____	$ _____	$ _____

STANDARD SHUTTLE CHARGE INFORMATION

Payload Chargeable Weight (lbs) _____, Length (In) _____; 1st Launch Date _____; Inclination _____;
Number of Flights in Series _____; Expected Date of Earnest Money Payment ; Is Payload Sharable? _____;
Do Use Fees Apply? _____; Calculated Charge Factor _____; Current Year Dollars Estimate As of _____,
B.L.S. Index to Date _____; Standard $ _____ Plus Use Fees $ _____.

OPTIONAL FLIGHT SYSTEM INFORMATION

DESCRIPTION:

22

PAYLOAD RELATED OPTIONAL SERVICE INFORMATION

	OPTION DESCRIPTION	ESTIMATE		OPTION DESCRIPTION	ESTIMATE

08/28/79

Estimates subject to escalation computed according to Bureau of Labor statistics Index for Compensation per Hour, Total Private; index to be referenced from "B.L.S. Index as of date" above.

JSC Form 692 (Jan 78) NASA-JSC

FIGURE 13-1

(Example)

1. Reference paragraph 6.1 - The NASA will conduct the (no.) structural coupled dynamic loads analysis cycle for (payload organization) as an optional service. The loads analysis will be accomplished utilizing payload organization) -provided spacecraft math models. The results will be provided to (payload organization) (if specified in paragraph 6.1).

2. Etc.

14.0 PIP ANNEXES

As identified in other section of the document, the following annexes are required from the User: (list to include those annexes defined in body of PIP)

1. Payload Data Package

2. Flight Planning

3. Flight Operations Support

4. Orbiter Command and Data

5. Payload Operations Control Center, Vol. 2

6. Orbiter Crew Compartment

8. Launch Site Support Plan

9. Interface Verification

15.0 SCHEDULE

The attached schedule, figure 15-1, provides a summary of the various technical areas requiring data exchange and/or products in support of the (payload)/STS integration activities.

The data indicated in Figure 15-1 under, "Reference Milestones," are included for information only and are controlled by the STS or User organization.

Dates indicated in Figure 15-1 under, "Standard Service Milestones," are directly related to the Launch date specified in the current STS manifest and will be adjusted and tasks accomplished according to the current NASA approved flight date. Necessary changes to the activities caused by change to the flight date, will be coordinated with the User thru the PIP change process.

16.0 APPLICABLE DOCUMENTS

The following documents are applicable to the extent stated herein:

a) NASA OSF "Safety Policy and Requirements for Payloads Using the Space Transportation System," NHB 1700.7, (current issue).

b) Implementation Procedure for STS Payload Safety Requirements, JSC-13830, dated May 1979.

c) STS/(payload) Interface Control Document TBD.

d) Shuttle Orbiter/Cargo Standard Interfaces, ICD 2-19001, dated_____ (insert latest date and change no.).

e) Space Transportation System Models Configuration Management/Control System and Standard Analyses for Payload Load Cycle, SD77-SH-0214, dated December, 1978.

f) KSC Launch Site Accommodation Handbook (K-STSM-14.1), current issue.

g) SPIDPO Change Control Requirements and Procedures Manual, JSC-13995B, dated August 17, 1979.

h) Shuttle/Payload Integration Activities Plan, JSC-14363

i) Space Shuttle System Payload Accommodations, JSC-07700 Volume XIV, dated _____ (insert latest date and change no.).

j) Criteria/Guideline for Payload Thermal Math Models for Integration Analysis, JSC-14686, dated January, 1979.

k) Payload Interface Verification Requirements, JSC 14046, (not released).

P.E. HUGH SCOTT PHONE NO. 5923
PIP NO.
SPIDPO SIGNED

□ STS
▽ P/L
○ JOINT

TYPICAL PAYLOAD INTEGRATION SCHEDULE

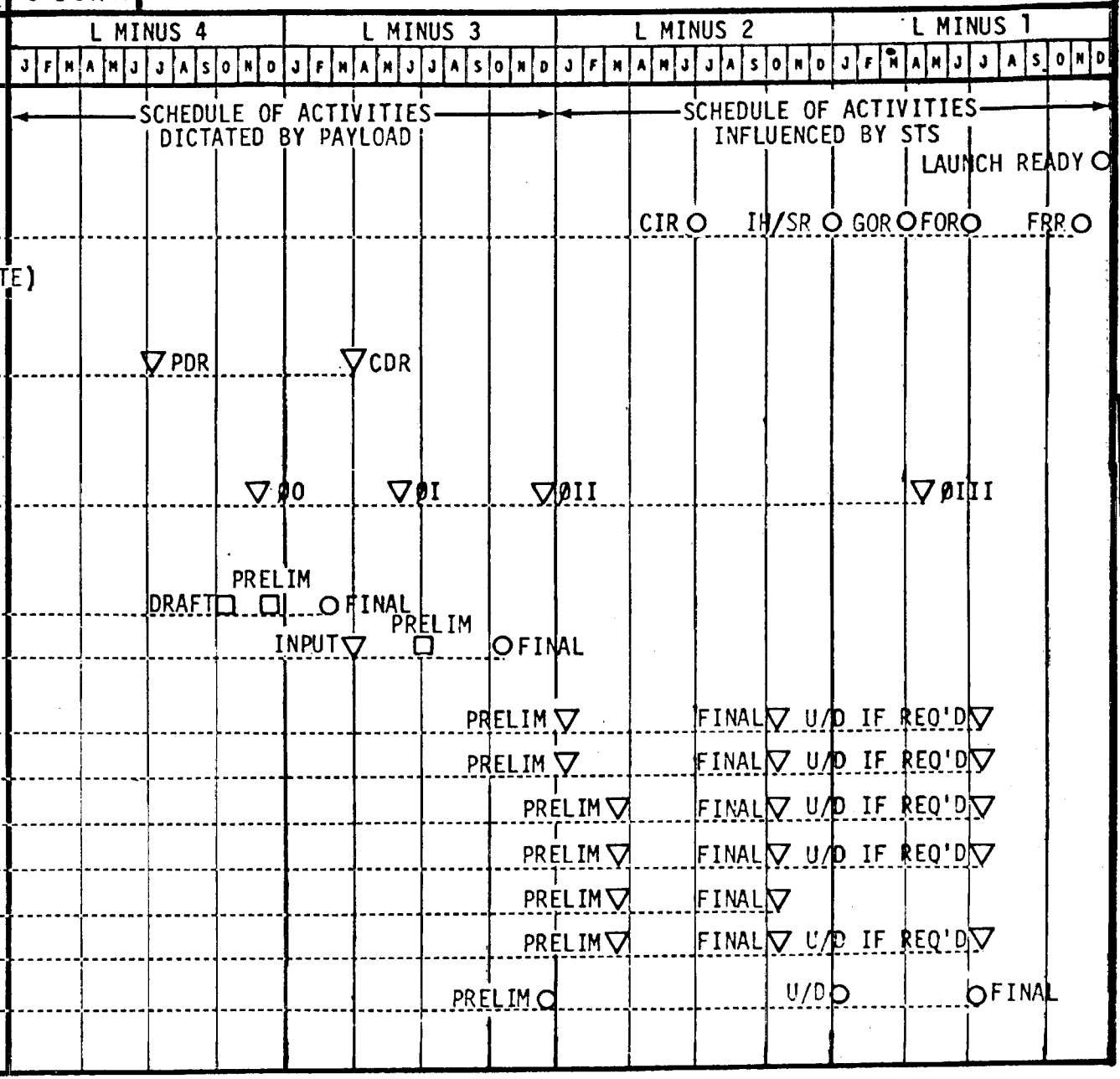

FIGURE 15-1

P.E. _____ PHONE NO. _____

PIP NO. _____

SPIDPO SIGNED _____

□ STS
▽ P/L
○ JOINT

TYPICAL PAYLOAD INTEGRATION SCHEDULE (CONT'D)

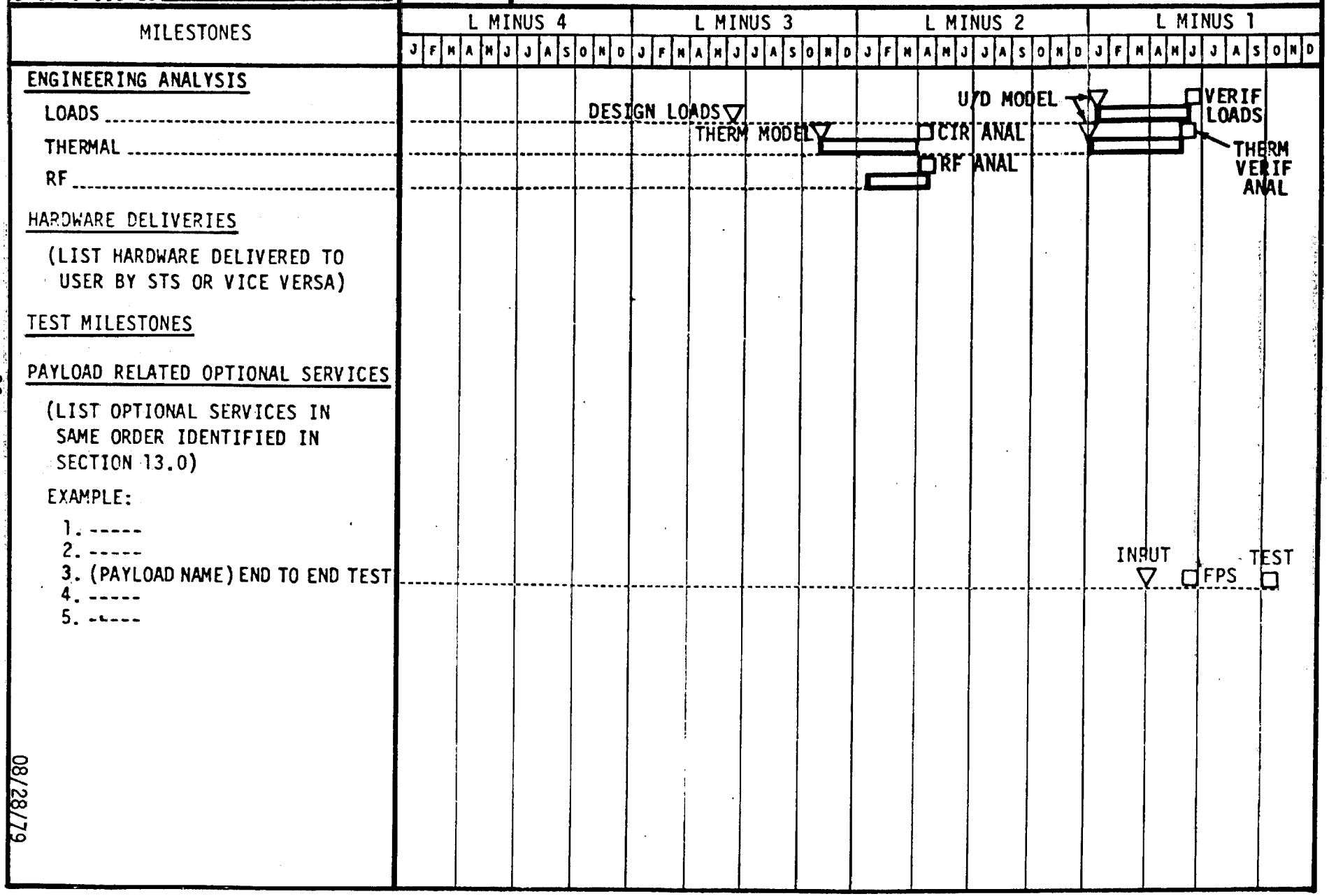

FIGURE 15-1 (CONT)

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